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Marshall Space Flight Center



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Improved Method for Calculating Pump Thermodynamic Suppression Head

The thermodynamic effects in a pump inlet, termed the "thermodynamic suppression head" (TSH), were studied analytically and compared with experimental values. TSH is a significant effect which must be considered when fluid pumps and flow components are designed for cryogenic temperature operation. The method of calculating TSH was improved by introducing the sound velocity of two-phase flow into the equation for the vapor-to-liquid volume ratio. Comparisons between the calculated and experimental values of the required net positive suction head (NPSH) and the TSH were made for a head coefficient ratio of 0.98. Calculation charts useful in evaluating the TSH are provided for oxygen, hydrogen, nitrogen, water and Freon 114.

For oxygen pumps, a good agreement was obtained between the calculated and measured values of required NPSH over the range of liquid oxygen temperature, and considerably better agreement was

obtained for the TSH when the sound velocity in two-phase flow was included in the equation of the vapor-to-liquid volume ratio. Similar results were obtained for the water and hydrogen pumps.

Note:

Requests for further information may be directed to:

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No patent action is contemplated by NASA.

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